Stan Stiz

A GUIDE TO THE COLLECTION AND SUBMISSION OF SAMPLES FOR LABORATORY ANALYSIS

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A GUIDE TO THE COLLECTION AND SUBMISSION OF SAMPLES FOR LABORATORY ANALYSIS

INTRODUCTION

Sample collection is the first and commonly most critical stage in the step by step procedure used to determine a substance or group of substances in the environment. From the standpoint of data interpretation, it is normally assumed that a representative sample has been taken. If the sample was not, in fact, representative, then all subsequent data interpretation will be erroneous. Similarly, once the sample has been collected, improper use of preservation techniques to stabilize the sample during transportation will lead to useless results.

In general, the sampler's aim must be to collect a representative sample from a known position (location) and transfer it to the laboratory with a minimal change in chemical composition of the parameter of interest. It is of little value to make an accurate analysis of an incorrectly collected sample.

IT CANNOT BE EMPHASIZED TOO STRONGLY THAT THE SAMPLER PLAYS A KEY ROLE IN ENSURING THAT THE DATA OBTAINED ACCURATELY REFLECTS THE FIELD SITUATION BEING ASSESSED.

ONTARIO MINISTRY OF THE ENVIRONMENT - LABORATORY SERVICES BRANCH

The various laboratories of the Laboratory Services Branch are equipped to perform a large number of standard and microbial analyses on domestic water supplies, surface waters, ground waters, and domestic and industrial wastes. Special analyses required for research studies and unusual pollution problems can also be provided.

Decentralization of the Ontario Ministry of the Environment has resulted in the designation of six regions with boundaries as given in Figure 1. Three of these, the Northwestern, Southwestern, and Southeastern have operational regional laboratories located at Thunder Bay, London and Kingston respectively. Samples collected within these regions are analyzed at the appropriate regional laboratory when analytical capability is available. When such capability is not available, these samples plus all those from the other three regions are analyzed at the Toronto laboratory. The tests performed by each Regional Laboratory as well as the five sectional laboratories in Toronto, are outlined in Table I. Field samplers should ensure that a laboratory is capable of analyzing the parameter(s) in question *before* shipping. Mobile laboratories and field stations are often provided to perform a limited number of tests in conjunction with major surveys or studies.

1 The laboratories of the Air Quality Laboratory provide analytical services for chemical and physical

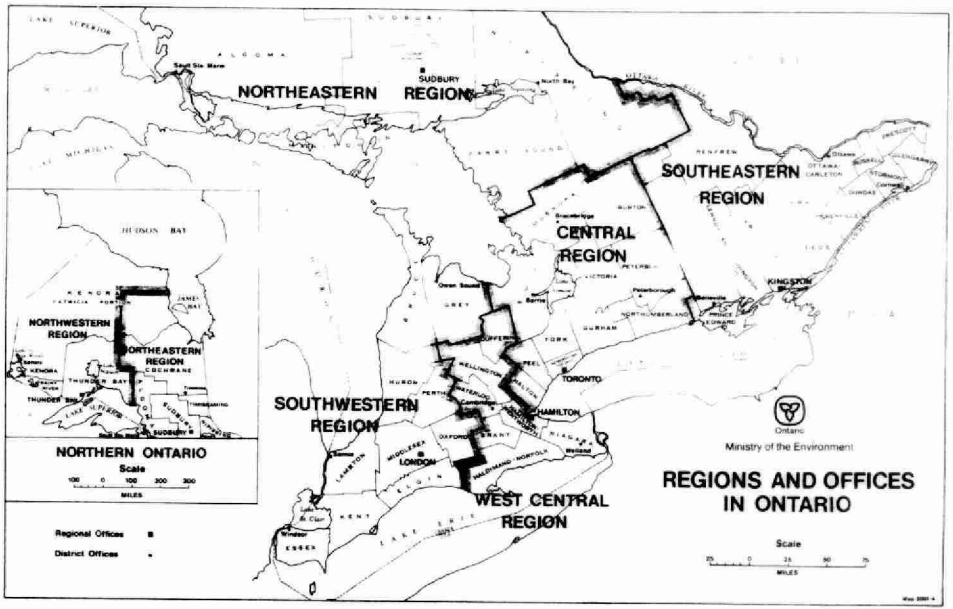
NORTHEASTERN REGION
SUDBURY
SOUTHEASTERN REGION
CENTRAL REGION
KINGSTON
TORONTO
HAMILTON
SOUTHWESTERN REGION
LONDON
WEST CENTRAL REGION
NORTHWESTERN REGION
NORTHEASTERN REGION
NORTHERN ONTARIO
Scale
MILES
Regional Offices
District Offices
Ontario
Ministry of the Environment
REGIONS AND OFFICES IN ONTARIO
Scale
MILES

TABLE I - ANALYTICAL TESTING CAPABILITIES
LABORATORY SERVICES BRANCH

CODE - TR - Toronto Rivers & Lakes
TP - Toronto Process Water
TI - Toronto Inorganic Trace Contaminants
TO - Toronto Organic Trace Contaminants
L - London
T - Thunder Bay
K - Kingston

A. MAJOR IONS

Parameter	TR	TP	TI	TO	L	T	K
Alkalinity	X	X			X	X	X
Calcium	X	X	X		X	X	X
Chloride	X	X			X	X	X
Conductivity	X	X			X	X	X
Hardness	X	X			X	X	X
Magnesium	X	X	X		X	X	X
Potassium	X	X			X	X	X
Silicates - Reactive	X				X		
Sodium	X	X			X	X	X
Sulphate	X	X			X	X	X

B. NUTRIENTS

Parameter	TR	TP	TI	TO	L	T	K
Ammonia N (filtered)	X	X			X	X	X
Nitrate N (filtered)	X	X			X	X	X
Nitrite N (filtered)	X	X			X	X	X
Orthophosphate (filtered reactive)	X	X			X	X	X
Total Kjeldahl Nitrogen	X	X			X	X	X
Total Phosphorus	X	X			X	X	X

C. METALS

Parameter	TR	TP	TI	TO	L	T	K
Aluminum			X				
Arsenic			X			X	
Barium			X				
Boron			X				
Cadmium			X			X	
Chromium			X				
Cobalt			X			X	
Copper			X			X	
Iron (Total)	X		X		X	X	X
Lead			X			X	
Lithium			X				
Manganese	X		X			X	
Mercury			X			X	
Molybdenum			X				
Nickel			X			X	
Selenium			X				
Silver			X				
Strontium			X				
Titanium			X				
Uranium			X				
Vanadium			X				
Zinc			X			X	

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D. ORGANIC PARAMETERS

Paramater	TR	TP	TI	TO	L	T	K
Anionic Detergents		X			X	X	
Biochemical Oxygen Demand	X	X			X	X	X
Carbon - Total Organic	X						
Carbon - Inorganic	X						
Carbon Dioxide	X	X				X	X
Chemical Oxygen Demand	X	X			X	X	X
Colour - Apparent	X	X			X	X	X
Pesticides				X			
Petroleum - Hydrocarbons				X			
Solvent Extractables				X			
Tannins & Lignins				X			
Volatile Acids		X			X	X	

E. OTHER PARAMETERS

Parameter	TR	TP	TI	TO	L	T	K
Acidity	X	X			X	X	X
Chlorophyll	X					X	
Cyanide			X				
Fluoride		X			X		
Nitrilotriacetic Acid				X			
pH	X	X			X	X	X
Phenolics - Reactive	X			X	X	X	
Resins & Fatty Acids				X			
Settleability		X					
Sludge Volume Index		X					
Solids - Filtered	X	X			X	X	X
Solids - Ignited	X	X			X	X	X
Solids - Suspended	X	X			X	X	X
Sulphide			X		X		
Turbidity	X	X			X	X	X
Vinyl Chloride				X			

evaluation of samples related to air quality assessment — dustfall, sulphur and fluoride candles, high volume filter papers, soils, vegetation, etc. The major laboratory facility is located in Toronto (880 Bay St., 3rd Floor), however a limited number of tests are performed by the Thunder Bay laboratory for the Northwestern Region. Testing capabilities are outlined in Table V.

A. SAMPLE COLLECTION FOR WATER QUALITY ASSESSMENT

I. SAMPLE COLLECTION FOR CHEMICAL ANALYSIS

1. GENERAL CONSIDERATIONS

The method of sample collection in the field is the concern of the individual involved. However, the following points should be noted:

a) The sample must be truly representative of the whole.

b) All possible sources of sample contamination (sampling devices, motor exhausts, disturbing of bottom sediments, use of inappropriate containers etc.) should be eliminated or reduced to a minimal level.

c) Since sample composition will change with time, rapid transportation to the laboratory is desirable. For some parameters, use of a preservative is recommended. Theoretically, this fixes the concentration of the parameter of interest and reduces the need for rapid transport and analysis (See III-3). However, in practice this only delays the perishability of the parameter and the sample should still be transported as quickly as possible.

d) For samples which do not have a preservative already in the collection bottle, rinsing *both* the bottle *and* cap with sample (two or three times) is strongly recommended. This procedure, while reducing any contamination that may be present, also tends to equilibrate the sample with the container walls and hence "container effects" (leaching, adsorption, etc.) are minimized.

2. SAMPLE CONTAINERS

In general, surface water samples are collected in *32 oz* or *20 oz* glass bottles, but some analyses require plastic containers. Table II summarizes the bottle type recommended for each parameter. Special studies may specify a certain container type and prior to collecting samples for such studies, the sampler should check on this requirement. Sludge samples are collected in wide mouth glass bottles and *never* filled more than half way. The extra space is required as an expansion zone for gaseous products that may be formed. Failure to handle these samples in this manner may result in container explosion during transit or at the laboratory.

Special acid washed plastic containers are required for trace level heavy metal determinations on surface and domestic waters. Domestic and industrial waste samples are normally placed in glass containers.

3. PRESERVATION TECHNIQUES

The function of a preservative is to stabilize the parameter of interest so that changes in composition during transit and prior to analysis are minimized. Several different preservation methods are recommended and these are outlined by parameter in Table II.

Preservation techniques usually involve the addition of a chemical which "ties up" the parameter in a form which is unaffected by sample ageing or else provides conditions unsuitable for any further reaction to occur. In some cases, refrigeration or freezing to reduce reaction rates provides the best preservation, particularly for those parameters which have a direct biological relationship (ie. with respect to growth, death, etc. — nutrients, toxic organic compounds, etc.).

The sampler should be aware that the use of the recommended preservative for one parameter may negate the possible analysis of another. For example, heavy metal samples preserved with nitric acid are unsuitable for phosphate analysis. It is the sampler's responsibility to determine from Table II whether use of a certain preservative will eliminate the possibility of analysis of another requested parameter, and provide suitable duplicate samples to correct the problem. If in doubt, consultation with laboratory staff is advised. Each duplicate should have the preservative used, clearly marked on the bottle label.

4. SAMPLE VOLUME

The analytical methods used to determine parameter concentrations require a certain minimum volume of sample in each case, as outline in Table II. The field sampler is expected to calculate the total volume of sample required by summing the specified individual volumes (Table II) for all the analyses requested and to submit the appropriate quantity. In addition, samplers are asked to submit at least *six ounces* of sample in excess of their original total estimate to allow for possible repeat analysis. Failure to provide sufficient sample volume will normally result in "Sample Exhausted" being marked on analyses report sheets.

In most cases, the volume required for analysis depends on parameter concentration, with "clean" samples (i.e. low concentrations) needing the largest amounts. Domestic water supplies, well waters, and unpolluted surface waters fall in this category. Tests for these sample types require the largest practical volume in order to provide a sufficient quantity of the substance of interest for reliable detection. Samples of high concentration (effluents, sewages, etc.) require a much smaller amount, or even a dilution may be employed.

TABLE II - SPECIFIC PARAMETER INFORMATION

	Parameter	Container	Preservation Technique	Minimum Volume Required for each Parameter (ml)	Comment (Syn = Synonym)
UNIT A MAJOR IONS	Alkalinity	Glass or Plastic	None	50	
	Calcium			100	
	Chloride			50	
	Conductivity			75	Syn = Specific Conductance
	Hardness			50	
	Magnesium			40	
	Potassium	Plastic or Glass		40	
	Silicates - Reactive	Plastic		50	Syn = Silica
	Sodium	Glass or Plastic		40	
	Sulphate			50	
UNIT B NUTRIENTS	Ammonia Nitrogen (Filtered)	Glass or Plastic	Freeze or Refrigerate	75	Syn = Nitrogen - Ammonia
	Nitrate Nitrogen (Filtered)				Syn = Nitrogen - Nitrate
	Nitrite Nitrogen (Filtered)				Syn = Nitrogen - Nitrite
	Orthophosphate (Filtered Reactive)				Syn = Phosphorus - Filtered Reactive
	Nitrogen - Total Kjeldahl		Refrigerate or Freeze		Syn = Kjeldahl Nitrogen Total Kjeldahl Nitrogen
	Phosphorus -Total				Syn = Total Phosphorus

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

	Parameter	Container	Preservation Technique	Minimum Volume Required for each Parameter (ml)
U N I T C M E T A L S	Aluminum Barium Cadmium Chromium Cobalt Copper Iron Lead Lithium Manganese Molybdenum Nickel Selenium Silver Strontium Titanium Uranium Vanadium Zinc	Plastic or Glass[2]	20 drops[1] HNO_3/Bottle	100
	Arsenic	Plastic or Glass[2]	None	50
	Boron	Plastic only	None	100
	Mercury	Glass only	20 drops HNO_3 + $KMnO_4$ to maintain slight purple colour/bottle	176[3]

[1] Nitric acid preservative should be added AFTER the sample is placed in the bottle.

[2] Acid washed plastic containers are recommended for ultra-trace analysis; foil cap liners of glass bottles used for routine samples may cause contamination, and plastic lined caps are recommended.

[3] A special 176 ml sample bottle similar to the microbial analysis type is usually provided for Hg samples.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

	Parameter	Container	Preservation Technique	Minimum Volume Required for each Parameter (ml)	Comment (Syn = Synonym)
UNIT D ORGANIC PARAMETERS	Anionic Detergents	Glass	Refrigerate	100	Syn = L.A.S., Linear Alkyl Sulfonates, Methylene Blue Active Substances, Detergents.
	Biochemical Oxygen Demand	Glass		500	Syn = BOD_5
	Carbon - Total Organic	Glass or Plastic		50	Syn - TOC
	Carbon - Inorganic	Glass or Plastic		50	Syn - IC
	Carbon Dioxide	Special *		*	Syn - Free CO_2. Special sampling required.
	Chemical Oxygen Demand	Glass		25	Syn = COD
	Colour - Apparent	Glass		75	Syn = Apparent Colour
	Pesticides	Glass only		900	Syn = Chlorinated Hydrocarbons
	Petroleum Hydrocarbons	Glass only		900	Syn = Hydrocarbons
	Solvent Extractables	Glass		900	Syn = Ether solubles
	Tannins and Lignins	Glass		200	
	Volatile Acids	Glass		25	

* CO_2 samples are to be carefully transferred from the sampling device into the bottom of a leak-proof glass stoppered container so as to prevent splashing (syphon); after copious overflow, the bottle must be stoppered so that no air bubbles are present in the container and rushed to a laboratory.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

	Parameter	Container	Preservation Technique	Minimum Volume Required for each Parameter (ml)	Comment (Syn = Synonym)
UNIT E OTHER PARAMETERS	Acidity	Glass or Plastic	None	50	
	Chlorophyll	Field Filtration Required	1 ml 10% $MgCO_3$ per litre of sample prior to filtration	1000	Contact Water Quality Section if there are any questions.
	Cyanide	Glass or Plastic	1 ml 50% NaOH per bottle	500	
	Fluoride	Glass or Plastic	None	50	
	Nitrilotriacetic Acid	Glass only	2 ml Formaldehyde per 20 oz bottle	600	Syn = NTA
	pH	Glass or Plastic	None	25	
	Phenolics - Reactive	Special	Provided	150 [1]	Obtain special bottle with preservative.
	Resins & Fatty Acids	Glass only	Refrigerate + 2 drops I N NaOH per bottle	900	One bottle should be submitted for this test exclusively, labelled Resin Acids. Syn = Fatty Acids
	Settleability	Glass	None	900	
	Sludge Volume Index	None	None	None	Calculated Parameter

[1] A special 176 ml sample bottle similar to the microbial type (with preservative added) is usually provided for samples requiring analysis for phenolics. A culture tube sample container with preservative is also available.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

	Parameter	Container	Preservation Technique	Minimum Volume Required for each Parameter (ml)	Comment (Syn = Synonym)
UNIT E OTHER PARAMETERS	Solids - Filtered	Glass	Refrigerate	75	Consult laboratory staff if low level analysis required.
	Solids - Ignited	Glass	Refrigerate	200	
	Solids - Suspended	Glass	Refrigerate	200	
	Sulphide	Glass or Plastic	Sodium carbonate + Zinc acetate.	900	Consult OMOE personnel prior to sampling for sulphide.
	Turbidity	Glass or Plastic	Keep in darkness.	50	
	Vinyl Chloride	Special	Keep in darkness	10	Special "hypovial" sample container available from the Toronto laboratory.

In certain cases where the sampler is unable to obtain sufficient sample volume or when re-sampling is impossible, analysis may still be obtained if special care and analytical techniques are used in the laboratory. This can only be achieved *after* consultation with laboratory personnel has been initiated by the sampler and *before* sample submission. A number of tests may be performed simultaneously on the aliquot, and consequently certain commonly requested combinations of parameters may require a smaller volume than expected. These will be discussed later. (P. 15)

5. SAMPLING METHODOLOGY

The sampler should be aware of how the particular details of his procedure (geographic location, time of day, method of obtaining the aliquot, etc.) may bias the results which are eventually obtained.

Care should always be taken to minimize sample cross-contamination by carefully rinsing (with sample) all materials used in collecting the aliquot which is sent to the laboratory. These precautions are particularly important for low concentration parameters.

6. FIELD RECORDS

It is in the sampler's own interest to keep complete records of his sample collection activity not only from the standpoint of date, sample number, location, description, etc. but also with regard to unusual features which may be extremely useful in tnterpreting the analytical data. This information may also prove invaluable in the event of sample loss, misnumbering of sample bottles or report sheets, etc.

II. SAMPLE COLLECTION FOR MICROBIOLOGICAL TESTING

1. GENERAL CONSIDERATIONS

It is the responsibility of the sampler to use aseptic conditions when handling the sterile bottles used for microbiological sample collection. Failure to do so will result in sample contamination and meaningless results. It is recommended that the techniques described below be closely followed in order to obtain reliable data.

2. SAMPLE CONTAINERS

Pre-sterilized *6 oz* bottles with blue labels are usually adequate for the routine sampling of water from distribution systems, surface water, well waters, etc. provided the waters have not been chlorinated. Chlorinated waters must be sampled in pre-sterilized *6 oz* bottles containing sodium thiosulphate (red label). Samples collected for special "nuisance" organism analyses should be collected in regular (blue label) bottles.

Samples collected at depth, are taken using sterile sampling bulbs obtained from Microbiology staff.

3. PRESERVATION TECHNIQUES

Sodium thiosulphate is used to neutralize the disinfecting properties of chlorine thereby preserving the existing microbial population at the time of sampling. This preservative is already present in the red labelled sample bottles.

4. SAMPLE VOLUME

In general, one bottle or bulb per sample provides sufficient volume for standard analysis. If, however, the bacteria levels expected are very low or extra parameters are being requested, then additional samples may be required. Consultation with Microbiology Staff is advisable in such cases.

5. SAMPLING METHODS

Sterile sampling bottles are available through Central Stores in Toronto. For special studies, alternate bottles are obtainable through Microbiology Staff on consultation. Samplers should check to see if the plastic seal on each container is intact before sampling. Containers with loose or cracked seals should *not* be used. All samples should be collected early in the week and shipped to the appropriate laboratory. During spring, summer and fall, samples should be packed in ice to minimize biological activity. In winter, samples should be packed in insulating material to prevent freezing while still keeping them cold. Immediate delivery to the laboratory *is essential*; analysis within six hours is preferable, but should not exceed twenty four hours.

Strict adherence to the following sampling procedures is recommended:

a) SURFACE SAMPLES

Clamp the bottle onto a sampling pole before removing the cap. Touch only the outer surface of the cap when opening the bottle. The inner lip and liner must not come in contact with anything except the atmosphere. If the inner surfaces of the cap or bottle lip are accidently touched, the sample has been contaminated and should not be submitted. The recommended procedure is to hold the cap with your fingertips until the sample has been taken. The cap must not be set down somewhere while the sample is being taken as this will result in contamination.

Surface sampling is accomplished by quickly lowering the sample bottle into the water approximately *one meter* below the surface with the mouth facing into the current. When sampling near shore, care should be taken to get a sample uncontaminated with sediment. The bottle is then removed from the water, the level adjusted to the top of the label, immediately capped, and then unclamped from the sampling pole. Samples must be collected using this prescribed technique. The use of a dipper or

other sampling device will result in contamination.

b) DEPTH SAMPLES

Depth samples are taken using sterile sampling bulbs. Bulbs should be used as quickly as possible: if not used, they should be returned to Microbiology staff within a maximum of two weeks, otherwise, the rubber will crack and the bulb will not open. The same care that is used with sampling bottles must be used in the handling of bulbs. The glass plugs supplied have been sterilized within a cellophane envelope and must not come in contact with any contaminated surfaces when they are being removed from the cellophane envelope. If, for some reason, the sampler should run out of glass rods, he may dip the metal plug into alcohol and flame it. After flaming, the plug is immediately inserted into the bulb, taking the usual precautions when handling sterile equipment. The use of the metal plug is discouraged and it should only be used in rare instances when the sample could not possibly be obtained at a later time in the correct manner.

c) TAP SAMPLES

Prior to sampling from a tap, the water should be allowed to run at full flow for approximately two minutes. The strong flow will clean out residual contamination around the orifice of the tap thus ensuring a more representative sample. The water pressure may then be reduced to permit taking the sample without excessive splashing which could result in contamination of the sample.

Fill the bottle to the top of the label being certain that the mouth of the bottle does not come in contact with the tap or any contaminated surface. The cap must also be handled aseptically as described previously.

d) SAMPLE DUPLICATION

When a duplicate sample is being taken, it should be obtained at the same time as the first sample. This can be achieved for surface samples by clamping two bottles on a sampling pole and for depth samples by placing two bulb samples on the sampling line in a "piggy-back" fashion.

III. FIELD ANALYSIS

The perishability of some parameters for which no chemical preservative is suitable necessitates in-situ field measurement. In the case of major field studies, a field laboratory facility for this purpose may be warranted. For example, such parameters as dissolved oxygen, dissolved carbon dioxide, free chlorine, chloramines, temperature and pH are so extremely perishable that *on-site* analysis is recommended. Temperature, pH and dissolved oxygen are conveniently measured using electrode sensors (and/or Winkler titration for dissolved O_2) while dissolved carbon dioxide, free chlorine, and chloramines require more complicated analytical techniques. Prior consultation with the Laboratory Services

Branch, Water Quality Staff, is recommended in these cases.

IV. SAMPLING BY PARAMETER

Specific information with regard to recommended sample bottle (*in order of preference*), preservation techniques (*in order of preference*), and volume required for each parameter, is given in Table II. Simultaneous analysis of certain parameters on a single aliquot allows a reduction in the volume required as follows:

1. Both total phosphorus and Kjeldahl nitrogen can be determined on a single *75 ml* (*3 oz*) aliquot.

2. Nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, and filtered reactive orthophosphate can be determined on a single *75 ml* (*3 oz*) aliquot.

3. Both sodium and potassium can be determined on a single *40 ml* (*2 oz*) aliquot.

4. Aluminum, copper, cadmium, cobalt, chromium, iron, lithium, molybdenum, manganese, nickel, silver, strontium and zinc can be determined on a *SINGLE 400 ml* (*14 oz*) aliquot. For very low levels, preconcentration necessitates that one full container (*900 ml*) be submitted for metals.

V. PARAMETER GROUPINGS

Although the laboratories have analytical capabilities for a wide diversity of water quality parameters, certain compatible groupings are requested with a consistently high frequency. Such group requests are usually associated with routine monitoring programs and/or specific projects. It is the nature of the groupings to allow analysis of all the specified parameters on a single or sometimes duplicate sample bottle. The six most common groupings are given in Table III.

Requests for one of these groupings should be made only when ALL the parameters are required. Specific environmental problems usually require specific analysis be performed, and, therefore, use of these groups is of little value. Large projects and studies may find it advantageous to use a grouping different from those in Table III and these may be established *after* appropriate consultation with the proper laboratory personnel.

VI. SAMPLE SUBMISSION

1. SAMPLE BOTTLE LABELLING

Sample bottles must be clearly labelled and contain the following information:

TABLE III

COMMON PARAMETER GROUPS

Group	Routine Parameters	Possible Additional Parameters	Bottle Type + Volume Required	Preservation Technique	Comment
Routine Drinking Water Group	Hardness, Alkalinity, Chloride, Iron, pH, Conductivity	Colour Turbidity	1 x 32 oz or 1 x 20 oz Glass or Plastic Bottle	Refrigerate	
Taste and Odour Group	Hardness, Alkalinity, Chloride, Nitrate, Iron, pH, Conductivity, Manganese, Kjeldahl Nitrogen, TOC		1 x 32 oz or 1 x 20 oz Glass Bottle	Refrigerate	Phenol is included in this group but requires a special bottle and preservative. Chloramine, H_2S may be included but should be measured in the field.
Ionic Balence Group	Calcium, Magnesium, Sodium, Potassium, Hardness, Alkalinity, Sulphate, Chloride, Nitrate	pH, Iron, Conductivity	1 x 20 oz or 1 x 32 oz Glass or Plastic Bottle	Refrigerate	

TABLE III

COMMON PARAMETER GROUPS (Cont'd)

Group	Routine Parameters	Possible Additional Parameters	Bottle Type + Volume Required	Preservation Technique	Comment
Well Characterization Group (for Domestic or Industrial Use)	Sodium, Potassium, Hardness, Alkalinity, Sulphate, Chloride, Nitrate, Conductivity, Manganese, Kjeldahl Nitrogen, Total Organic Carbon	Total Phosphorus, Iron, Calcium, Magnesium	2 x 32 oz or 2 x 20 oz Glass or Plastic	Refrigerate	H_2S may be included but should be measured in the field.
Sewage Group	BOD, Ammonia, Nitrate, Phosphorus, Kjeldahl Nitrogen, Total Phosphorus, Suspended Solids, Dissolved Solids	COD, Nitrite	2 x 20 oz or 1 x 32 oz Glass Bottle	Refrigerate	
Trace Metal Group	Cadmium, Copper, Iron, Lead, Zinc		1 x 32 oz Plastic Bottle	20 drops HNO_3	

a) A sample (sender's) number. The use of a *SIMPLE* field numbering system is encouraged.

b) Some other identification, normally the sample source or type (eg. "Lake Temagami - Sharp Rock Inlet").

c) Presence of any *chemical* preservative added; all others will be kept refrigerated or frozen (i.e. as received) until time of analysis.

d) Indication of a single specific analysis required for that one sample bottle; i.e. when the sample has been preserved for resins and fatty acids analysis, it should be labelled "For Resin Acids", or when submitted for preconcentration and heavy metal analysis, it should be labelled "For Pre-concentration".

2. SUBMISSION FORMS

Submission forms must accompany all samples and should include the following information, completed in *black* pen. (See Figure 2)

a) The required analytical parameters listed on the back; this listing should always be present *including* the occasions when a parameter group is specified. Samples cannot be accepted with such requests as "chemical analysis" or "all the metals". Specific parameter identification is necessary and in some cases (i.e. pesticides), the specific compound or class is required. If there is some doubt concerning which analysis to request, a brief description of the general problem or reason for sampling will enable the laboratory staff to select the appropriate tests.

b) The sender's number corresponding to the number marked on the bottle.

c) The other sample identification provided on the bottle.

d) The sampler's name.

e) The name, address *and* phone number of the person to whom the results are to be reported.

f) Sampling date.

g) Program or study under which the sample was collected. (Note region or head office branch)

3. GENERAL

If a group of related samples is submitted, a map of the area or the relative location of waste inputs is very helpful to the laboratory staff. Please number the samples in a logical order, e.g. downstream

Ontario

RECORD THE GENERAL SUBMISSION NUMBER
GENERAL SUBMISSION A11419
MINISTRY OF THE ENVIRONMENT

ON THE SAMPLE BOTTLE LABEL
SAMPLER: READ THE INSTRUCTIONS ON THE BACK OF THIS SET

PAGE 1 OF 1

MUNICIPALITY, TOWNSHIP OR DISTRICT: Sudbury
SOURCE: Nelson Lake
REGION DIST

CARD 01 | SAMPLED BY: J. Doe | AREA CODE PHONE NO.: 705 522 8181 | SAMPLING AGENCY | STUDY S.P. PROJ. ANALYZING LAB: 1,0,5,0,8,2,2

9 TESTS REQUIRED (MORE SPACE ON BACK)

Ionic Balance Group (Ca, Mg, Na, K, Hardness, Alkalinity, Sulphate, Chloride, Nitrate)

DATE SAMPLED: 8-16-76
DATE RECEIVED
DATE APPROVED
DATE REPORTED

LABORATORY USE ONLY

70 | 1 | 2 | 3 | 4

CARD 10 | FIELD SAMPLE NO. 1 | NO. BOT. 1 | T-Cl2 | TIME 9
SAMPLE DEPTH 1.0 | WATER DEPTH 13.0 | W. TEMP 6.8 | A. TEMP
STATION LOCATION
STN. 1, SURFACE
SAMPLE DESCRIPTION

20 | FIELD SAMPLE NO. 2 | NO. BOT. 1 | T-Cl2 | TIME 9
SAMPLE DEPTH 12.0 | WATER DEPTH 13.0 | W. TEMP 9 | A. TEMP
STATION LOCATION
STN. 1, BOTTOM
SAMPLE DESCRIPTION

30 | FIELD SAMPLE NO. 3 | NO. BOT. 1 | T-Cl2 | TIME 13
SAMPLE DEPTH 1.0 | WATER DEPTH 20.0 | W. TEMP 19 | A. TEMP
STATION LOCATION
STN. 2, SURFACE
SAMPLE DESCRIPTION

40 | FIELD SAMPLE NO. 4 | NO. BOT. 1 | T-Cl2 | TIME 13
SAMPLE DEPTH 19.0 | WATER DEPTH 20.0 | W. TEMP 4 | A. TEMP
STATION LOCATION
STN. 2, BOTTOM
SAMPLE DESCRIPTION

FIGURE 2

in a river. All analyses are routinely screened for anomalous results before they are released. Suspicious results might be improperly rejected whereas some details as to the location would confirm their validity. When a sample is sent to the laboratory, a description of known constituents should be included on the submission sheet, particularly an unusual one such as industrial waste contaminant. Interferences (reactions which produce false analytical results) can be eliminated by pretreatment if the analyst is forewarned. Samples known to contain cyanide, arsenic, mercury or other toxic materials should be clearly marked (warning label with substance identification) for the protection of laboratory personnel.

Identification of unknown contaminants is very time consuming. Samples should be as large as possible to allow a wide range of exploratory tests. The sampler should indicate whether qualitative or quantitative results are required. Any available information concerning the sampling point, possible contaminants, and industries implicated is extremely important for such samples.

Samples which are not homogeneous present analytical difficulties because it is virtually impossible to take a representative aliquot. If the sampler is only interested in one phase (aqueous, solid or immiscible organic), he should label the submission form accordingly. Otherwise the laboratory will consider the whole sample, and take aliquots of the mixture.

Samples sent to the Central laboratory, Toronto, could be analysed by as many as four different sectional laboratories; the distribution of analyses among these sections is shown in Table I. Sample processing is much more efficient if the sampler submits separate forms and separate sample containers if testing is to take place in more than one of these sectional laboratories. Your co-operation in this respect will be truly appreciated by everyone involved.

4. SAMPLE CONTAINER REQUISITION AND SHIPPING PROCEDURES

Sample containers may be requisitioned according to need using the information provided in Table IV. It should be noted that *32 oz* glass bottles are no longer available.

Certain projects or studies may require the use of special container types, and appropriate enquiry should be made prior to requisition.

CN Express and CP Express provide the fastest and most reliable service for the shipment of environmental water samples in Ontario. Air Express, parcel post, bus companies and other services discourage the shipment of water samples because of the damage caused to other shipments when breakage occurs.

Contract numbers are important as they provide the only means for tracing a lost shipment. Every shipment is assigned a contract number at the Express Depot, but it is generally up to the sampler to attach this contract number to each carton of his shipment. Identification stickers are provided

TABLE IV

SAMPLE BOTTLE REQUISITION

STOCK NUMBER	DESCRIPTION
70-P-21	Pack #1: 8-20 oz. Bottles, glass
70-P-21S	Pack #1S: 8-20 oz. Bottles, glass, Special Cap (plastic liner)
70-P-22	Pack #2: 2-20-oz. Bottles, glass
70-P-23	Pack #3: 1-20 oz. Bottle, glass
70-P-24	Pack #4: 8-32 oz. Bottle, glass, Wide Mouth
70-P-25	Pack #5: 16-16 oz. Bottles, glass, Wide Mouth
70-P-26B	Pack #6B: 2-6 oz. Bottles, glass, Bacti Blue
70-P-26T	Pack #6T: 2-6 oz. Bottles, glass, Thio Red
70-P-26P	Pack #6P: 2-6 oz. Bottles, glass, Phenol Green
70-P-27B	Pack #7B: 4-6 oz. Bottles, glass, Bacti Blue
70-P-27T	Pack #7T: 4-6 oz. Bottles, glass, Thio Red
70-P-27P	Pack #7P: 4-6 oz. Bottles, glass, Phenol Green
70-P-28B	Pack #8B: 72-6 oz. Bottles, glass, Bacti Blue
70-P-28T	Pack #8T: 72-6 oz. Bottles, glass, Thio Red
70-P-29	Pack #9: 8-32 oz. Bottles, Polyethylene, Wide Mouth, 63 mm cap size
70-P-30	Pack #10: 8-32 oz. Bottles, Polyethylene, Wide Mouth, Acid Washed.

by the Express companies upon request. Samplers are urged to keep a record of all their contract numbers.

The following addresses should be used when shipping samples to the various laboratories:

a) CENTRAL REGION - MAIN TORONTO LABORATORY

Ontario Ministry of the Environment,
Central Stores,
Resources Road,
Highway 401 and Islington,
Toronto, Ontario

b) SOUTHWESTERN REGION - LONDON LABORATORY

Ontario Ministry of the Environment,
Southwestern Regional Laboratory,
985 Adelaide Street S.,
London, Ontario

c) NORTHWESTERN REGION - THUNDER BAY LABORATORY

Ontario Ministry of the Environment,
Thunder Bay Regional Laboratory,
411 Donald Street East,
Thunder Bay, "F", Ontario

d) SOUTHEASTERN REGION - KINGSTON LABORATORY

Ontario Ministry of the Environment,
Southeastern Regional Laboratory,
133 Dalton Street,
Kingston, Ontario

Further enquiries regarding container requisitions, shipping, etc. whould be directed to Central Stores in Toronto (telephone 248-3020).

VII. LEGAL SAMPLING

Sampling in connection with legal action naturally requires special care due to the profound influence this sampling may have on the case outcome. Court cases are usually initiated to determine legal responsibility for reported pollution events (stream, well contamination, etc.) and sampling must be conducted with this purpose in mind. In general, the same procedures outlined earlier may be used. However, the following additional points are very important and should be *precisely* adhered to:

1. The sampling area should be completely "walked" i.e. checked over at the time samples are taken; the sampler will then be completely familiar with the overall geographic "picture" (i.e. ALL possible contamination sources, unusual occurrences, and a "blank" sample location far enough away (upstream) that no contamination from the sources in question can influence it). Preparation of a sketch map of the area is recommended.

2. The sampler should be careful to obtain samples at *all* possible contamination sources, not just the one in question. The observed contamination should be traced back to its source, and samples collected at key points to show continuity. In the case of an underground sewer, when the defendant or his official agent is unwilling to confirm continuity of flow of his wastes through the sewer, in front of a witness, the sampler should verify continuity by passing some small, identifiable floating object through the sewer, and recovering it at the outfall. Similarly a series of samples downstream is advised to show how the contamination effect persists. *A pre-requisite is a 'Blank' sample, unaffected by the alleged pollution*, (obtained upstream, or from a nearby well, etc.).

3. The sampler should obtain prior knowledge of exactly what type of contamination he is dealing with (i.e. what parameter(s) will be measured) and sample accordingly with respect to correct bottles, preservatives, etc.

4. Legal samples must be analyzed in duplicate and thus it is recommended that at least *three times the normal volume* be submitted. Any remaining sample may then be used for further confirmation or presentation in court.

5. *The actual sampling must be done in front of a witness* who is willing to sign a witness affidavit and appear in court if necessary.

6. A complete record of exactly described sampling locations, time and date, bottle numbers, preservatives, etc. must be made. Submission sheets should accompany the samples in the normal manner. However, it is emphasized that the sample description and number on the bottle must *exactly* correspond to that on the sheet. If not, the certificate of analysis can be questioned, and may not be accepted as evidence.

7. The sampler must be able to swear that the samples were in his possession and control before arrival at the lab, and not tampered with in any way. Locking the samples in the car trunk and delivering them directly to the official laboratory "analyst" is best. Otherwise, shipping boxes should be locked and the keys sent by a different route, normally registered mail, addressed to the "analyst" at the lab. The Toronto Laboratory Stores can provide special locks to return legal samples, for which the main Laboratory Analysts (only) have keys.

8. Enquiries should be directed to C. Simpson, Project Scientist, Resources Road, Toronto, 416-248-3064.

VIII. ENQUIRIES

Attention is drawn to the "Outlines of Sampling and Analytical Methods" for more specific information with respect to parameter descriptions, analytical methods, sampling restrictions. People to whom enquiries must be addressed by telephone are listed in Appendix I.

All samples received by the Laboratory Branch are assigned numerical codes according to sample type. When the analyses are completed, the results are entered onto the original submission sheets, checked by the scientist-in-charge, and sent for typing. All original submission sheets are retained in the sample reception files. Laboratory staff are prepared to answer questions regarding the receipt and progress of samples but require the following information:

1. Municipality or Township in which the sample source is located.

2. Name of engineer, biologist etc. to whom the analytical report is to be submitted.

3. Name of program or study.

4. Sampling date and estimated day of arrival at the laboratory.

5. Location codes or other sample identification number. Laboratory numbers are preferred, if known.

6. Type of sample (e.g. water, river, sewage, industrial wastes, Great Lakes, etc.)

B. SAMPLE COLLECTION FOR AIR QUALITY ASSESSMENT

Assessing air quality problems usually requires special techniques, and prior consultation with Air Quality Laboratory personnel is recommended. Before instituting a new survey, the laboratory staff should be consulted regarding sampling locations, frequency, analysis required, etc.

I. ANALYTICAL TESTING CAPABILITIES

There are four laboratory units in the Toronto Air Quality Section and their analytical capabilities are indicated in Table V. Further information with regard to analytical capabilities may be found in the laboratory booklet, "Outlines of Sampling and Analytical Methods" *or* obtained upon consultation with laboratory staff. See Appendix I.

II. DUSTFALL SAMPLING

The clean polyethylene dustfall collector jar (*12" tall x 6" diameter*), identified by Station number, is attached to a suitable support assembly, uncovered, and allowed to collect all settleable material over a one month period. The collectors are located to provide particulate samples that are representative of the area being studied.

The collector should have a clear field of exposure, being free from interferences from buildings or other high objects or structures. Accessibility and security are major considerations in site selection.

The top of the container should be a minimum of *8* and a maximum of *50 feet* above the ground and at least *four feet* above any other surface in the vicinity. Attachment to hydro poles is a common method of support.

During summer, an aqueous solution containing *2 mg* of $CUSO_4$ or quaternary ammonium chloride (*1* to *2 mg/l*) may be added as an algal and fungal inhibitor when this substance will not affect the desired analysis. The partially filled dustfall jar tends to retain fine particulates which are sometimes lost by the dry container. The use of "wet" jars is not universal, however, and consultation with laboratory staff is recommended.

It is important to establish the down-wind direction from the source being investigated and position the dustfall jar accordingly. After approximately a one-month period the jar should be removed, capped, and taken to the laboratory for analysis. Since the jar *must* be kept in an upright position, shipping by CN, CP etc., is not feasible.

It is very important that a record of station number, installation date and removal date accompany the jar, since this information is necessary to complete the analysis.

TABLE V - ANALYTICAL TESTING CAPABILITIES
AIR QUALITY LABORATORY

CODE - I = Inorganic Section
O = Organic Section
P = Physical Section
VS = Vegetation & Soils Section

A. METALS					B. ORGANICS					C. OTHER				
Parameter	I	O	P	VS	Parameter	I	O	P	VS	Parameter	I	O	P	VS
Aluminum	X			X	Benzene Soluble Organics		X			Dustfall *	X			
Arsenic	X			X	Benzo (a) pyrene		X			Sulphation Rate	X			
Barium	X			X	Benzo (k) Fluoranthene		X			Fluoridation Rate	X			
Boron	X			X	Vinyl Chloride		X			Total Suspended Particulate*	X			
Cadmium	X			X	Freons		X			Carbon-Free			X	
Calcium	X			X	Methane		X			Carbon-Total			X	
Chromium	X			X	Ethane		X			Chloride			X	X
Cobalt	X			X	Ethylene		X			Fluoride	X			X
Copper	X			X	Other Aliphatic Hydro-carbons		X			Silicon	X		X	
Iron	X			X						Sulphate	X			
Lead	X		X	X	Benzene		X			Sulphur-Total	X		X	X
Lithium				X	Toluene		X			Asbestos (in Air & Water)			X	
Magnesium	X			X	Xylenes		X			Particulate Identification (Complaint Samples)			X	
Manganese	X			X	Chlorinated Hydrocarbons		X			Nitrate	X			
Mercury	X			X						Phosphorus			X	X
Molybdenum	X			X						pH				X
Nickel	X			X						Ammonium				X
Potassium	X			X						Loss on Ignition	X		X	
Selenium	X			X						Sieve Analysis			X	
Silver	X			X						Particle Size by Microscopy			X	
Sodium	X			X										
Titanium				X										
Vanadium	X			X										
Zinc	X			X										

* Tests performed both in Toronto and Thunder Bay

III. "HI VOL" FILTER SAMPLING

The collection of suspended particulate material involves filtering of the dust on a filter mat (usually *8" x 10"* glass fibre filters currently supplied by General Metals Ltd.) using a vacuum pump capable of drawing at least *40 ft ^{3}/min.*

The normal sampling period is *24 hours*. A complete description of the Hi-Vol sampling device and procedure may be obtained from the ASTM,"Gaseous Fuel Coal and Coke Atmospheric Analysis" Part 26, November 1974. The sampler consists of a face plate, gasket, and retaining ring, a filter adapter assembly, and finally the vacuum pump unit. The whole sampler is contained in a protective shelter.

Pre-weighed and coded glass fibre filters are available from the Air Quality Laboratory for use with these samplers. The filter must be carefully installed (rough side upwards) on the sampler and the serial number recorded (if not already present) on the provided protective envelope. Ripped or punctured filters must be discarded. If difficulty is encountered due to wind, it may help to switch on the motor, thus holding down the filter while it is being secured by the frame. Do not touch the collection surface of the filter at any time. Once the sampler has been prepared, the air flow should be measured using the orifice manometer and the reading recorded on the envelope along with the pre-set time for start up. After shut down, flow reading and time should once more be recorded. The filter should be carefully removed, folded in half, particulate side inwards and placed in the corresponding envelope. Any comments particular to the sampling occasion may be very useful when test results are later evaluated. The field technician is encouraged to note any unusual occurrences on the comments portion of the envelope.

Do not place anything else in the envelope except the filter and mail to Air Resources Branch, 880 Bay Street, (4th Floor), Toronto, for calculation of the air volume. The Air Resources Branch then forwards the sample to the Air Quality Laboratory for analysis. High Volume filters for samples collected in the Northwestern Region are obtained from and sent to the regional lab in Thunder Bay.

In summary, the filter envelope must contain the following information:

a) Station number (i.e. sampling location)
b) Hi-Vol number and date
c) Filter number
d) Operator
e) Flow readings and time before start-up and after shutdown.
f) Comments regarding and features particular to this sample or sampling period.

IV. SULPHATION AND FLUORIDATION CANDLES

Sulphation and fluoridation rates are measured using the appropriate "candles" or "plates". These devices may be obtained for the Air Quality Laboratory. The candle or plate should be removed from

the protective container and placed over the peg inside the candle cage or in the plate holder. A complete description of the sulphation candles and sampling stations can be found in the ASTM, "Gaseous Fuel Coal and Coke Atmospheric Analysis", Part 26, November 1974.

Sampling equipment and installation are provided by the field staff. The stations should be located between 6 and 15 feet off the ground, and although less susceptible to the problems associated with dustfall jars, should be isolated from any obvious local interferences. Normal exposure time is thirty days. After exposure is complete, the candle or plate should be carefully replaced in its protective container, placed in its shipping container and sent to the Air Quality Laboratory, 880 Bay Street, 3rd Floor, Toronto, Ontario. Proper sealing of the candle or plate is important since this prevents any further sulphation/fluoridation occurring during transit. Field staff should take care not to touch the reactive surface of the candle or plate at any time. The duration of exposure must be recorded and submitted with the candle.

V. VEGETATION AND SOIL SAMPLING

1) General

The Phytotoxicology Section, Air Resources Branch (880 Bay Street), is responsible for the investigation of all complaints concerning suspected air pollution damage to vegetation or contamination of soil and the establishment of all vegetation and soil assessment surveys in the vicinity of proposed or existing industrial emission sources. The exception is in the NE and NW Regions, where the work is performed by the Technical Support Sections, with the assistance as required from Phytotoxicology personnel.

2) Types of Investigations

a) Assessment Surveys

These surveys are conducted to document endemic conditions prior to the establishment of emission sources, to define the current state of air emissions from existing sources, and/or to monitor source compliance with Ministerial orders. Normally, a sampling grid is constructed, centred on the source and samples are taken from established stations located at increasing distance along radii from the source to the limits of suspected contamination. Consideration is given to the location of air quality monitoring insturments and meteorological parameters such as prevailing wind direction.

b) Complaint Investigations

Samples may also be taken to evaluate situations where extensive damage to vegetation has been observed. Awareness of this case will usually be drawn to the Ministry's attention through

complaints by individual citizens. All complaints of this nature should be referred to the Phytotoxicology Section. They will be investigated and reported to the individual originating the complaint and to the source of the contaminant.

3) Sampling Procedures

To ensure a meaningful, unbiased interpretation of analysis data, all samples that are to be compared must be carefully matched with regard to plant species, age or maturity of leaf tissues, age of tree or shrub. Usually, foliage is collected from the side of the tree or shrub facing the presumed source of air pollution but, occasionally, a second sample may be taken from the side opposite from the source. Samples are taken by trimming outside growth from ground level up to *20'* or more and collecting all leaves to provide a composite sample of *500* to *1,000 grams* of fresh material.

Current practice is to collect three samples from each sampling location (triplicate sampling). Samples are placed into *perforated* polyethylene bags and are transferred to refrigerated storage as soon as possible for processing in the Phytotoxicology laboratory. Forage samples (grass) are collected by cutting the terminal *25 cm* (*10"*) of stems and blades over the representative area to be sampled, at 10-step intervals. Dried flower heads and stalks are discarded and no root material whatsoever is included. The different forage species included in the sample are identified and are representative of the population of the species in the field.

Any sample contaminated by roadside dust should be avoided or commented upon in the accompanying request form.

Soil samples are normally collected in conjunction with vegetation samples as an aid to differentiate between current and past emission situations. Occasionally, soil samples will be collected to establish background conditions.

Soil is collected with a *2 cm* (*3/4"*) diameter stainless steel tube. A minimum of *10* cores is taken from the sampling site. Also, all soil samples are collected in triplicate (i.e. minimum *3* x *10* cores) and the collection form is completed to comprehensively describe the texture of the soil and the overall sampling site. Each core must be separated into fractional depths of *0 - 5 cm*, *5 - 10 cm* and *10 - 15 cm*, and each level is placed in an appropriately labelled plastic bag for shipping.

Ideally, soil should be sampled from an entirely undisturbed or sodded area and contaminated situations should be as closely matched as possible with conditions existing immediately outside of the area.

4) Sample Stabilization

All vegetation samples as collected,are potentially unstable, and will decompose unless properly

handled. Vegetation samples can be preserved for a few weeks under refrigeration; when dried at 80°C for 30 hours in forced draft oven, they become almost permanently stable.

5) Sample Identification

Collection of vegetation and soil samples is accompanied by the completion of a pre numbered PS2-1975-6 form (Phytotoxicology Field Sample Collection Form) which will later provide all the necessary information required for interpretation test results. The lower portion of the form is detachable and is placed in the sample for identification. Normally samples are "double-bagged" with the numbered field sample enclosure slip placed between the outer and inner bags. A typical field sample collection and enclosure form is illustrated in Figure 3.

VI. ORGANIC CONTAMINANT SAMPLING

Sampling for organic contaminants commonly requires special methods and equipment, and prior consultation with the laboratory is essential in all cases.

Some organic contaminant analyses, such as BaP, BkF, PAH and benzene soluble organics, may be performed on sub-samples from the Hi-Vol filters and field sampling instructions in this regard are the same as discussed previously. These filters should be kept protected in envelopes in a cool place.

Samples for the analysis of vinyl chloride, Freons, volatile aliphatic and aromatic hydrocarbons are collected by passing 100 to 1,000 mL of air per minute through a specially prepared tube containing activated charcoal or Chromosorb. The normal sampling period is 2 - 4 hours. The tubes are available from the Air Quality Laboratory. The sample, once collected, should be refrigerated and kept in the dark. The sample label (wrapped around the tube) must have the following information marked on it:

a) Sample flow
b) Date, location, time on, and time off
c) Flow on, and flow off
d) Wind speed, direction and temperature.

Other available forms of samplers are: Tedlar bags, aluminized Mylar bags, evacuated glass and metal containers for "grab" sampling.

Samples should be shipped (mailed) to Air Quality Laboratory, 880 Bay Street, (3rd Floor), Toronto

PHYTOTOXICOLOGY FIELD SAMPLE COLLECTION FORM – PS2 1975-6

FIGURE 3

Ext. Request	
Assess. Survey	✓
Expt.	

Day 06 Month 07 1975-6

Collectors RGP PJT DSH

Indicated Source: Acme Manufacturing Co. Sample No.: № 3375

Location: Station AMC -10

700 M NE

Control Area ☐

(MAP) N — Silver Maple — House — JOHN ST Lane — Barn

Plant Spec.: Silver Maple

Ht 12 m DBH 45-50 cm Age 40-50 No. Sampled 1

Foliage 75 74 73 : Twigs 75 74 73 : Roots Stems Fruit

General Remarks: some thinning of crown

Forage (% comp.)

Leafy Mostly Stems Green Senescent

Cut Uncut Grazed Lawn Pasture

Soil: 0-10; 0-5; 5-10; 10-15; 15-20;

Sandy Loam Silty Loam Clay Organic Coarse Aggregate Saturated Moist Dry

Barren Sod Cover Crop or Garden Cover Grassy Weedy

NATIVE SOIL < cultivated undisturbed URBAN SOIL < cultivated disturbed undisturbed

Snow: Depth of Samp. ____ Tot. Depth ____ Fresh Depth ____

Fresh Old Mixture Acid Not-Acid

Other Samples:

Description and Degree of Injury in Sample and Suspected Cause

% Foliar Inj.	Suspected Pollutant Injury							
	NECROSIS			CHLOROSIS			Fleck Bronze	Glaze
	T	I	M	T	I	M		
1-5								
6-15	F		F					
16-35								
> 35								

% Foliar Inj.	Non-Pollutant Injury						
	Insect Skel. Min. Chew	Pathogen	Herbic	Nut Def.	Mech.	Physiol. T, Wi, LSLS, MD	
1-5						LSLS	
6-15							
16-35							
> 35							

Remarks:

Rep 1

NW	W	Herb	Path	Hist	OTHER					
					ID	Fert	Pest	Cryst	Bioas	
✓	✓	✓		✓						

MOE 16 : 032 3-75

PHYTOTOXICOLOGY FIELD SAMPLE ENCLOSURE

PS3(a) 1975-6

Ext. Request	
Assess. Survey	✓
Expt.	

Sample No.: № 3375

Day 06 Month 07 1975-6

Sample: Silver Maple

Special Instructions:

Approx. No. Chemicals: 1

Take pH

NW	W
✓	✓

1975-6 Sample No.: № 3375 NW

1975-6 Sample No.: № 3375 W

VII. ASBESTOS SAMPLING

1) Water

The analytical technique for asbestos determination involves a time consuming electron microscopic inspection of the sample. The extreme care and time required for this analysis makes it a very costly test, and very long sample back-logs are common. For these reasons, sampler discretion regarding submission of asbestos samples is requested. *No sample should be submitted without previous consultation with laboratory personnel.* Every attempt should be made to preserve the integrity of the sample.

Water samples to be tested for asbestos fibre content should be collected in *1 litre* (approx.) glass or plastic bottles with NO preservative added. The usual sampling precautions of multiple bottle rinsing, rapid transport to the laboratory, etc. are of particular importance for asbestos.

2) Air

Airborne asbestos is collected using a modified Hi-Vol sampler. Particulates are collected on a *0.4* µ pore size, *8"* x *10"* Nucleopore filters. At the present it is recommended that the Hi-Vol instrument be equipped with a transducer and continuous air flow rate recorder.

Sampler modification consists of installation of a flange with a *3/4"* hole on the air exit of the sampler. This acts as a limiting orifice and brings the air flow chart reading into a suitable measurement range for *0.4 micron* pore size Nucleopore filters. Hi-Vol calibration prior to taking sample is necessary (procedure may be obtained from the Physical Methods Laboratory, Resources Road, Toronto, or the Technical Services Group, Central Region, 880 Bay Street (1st floor), Toronto).

It is very difficult to change the filter in the field and PRE-INSTALLATION in the Hi-Vol filter cassette INSIDE AN ENCLOSED AREA is recommended. Removal of the filter should be handled in like manner.

After exposure, the filter is carefully removed from the cassette, placed exactly on the *8"* x *10"* separator paper supplied with the filter and both are then folded in half along the *8"* width. The folded filter and separator are placed in a suitable glasine envelope, which is then sealed.

The glasine envelope with filter is then mailed in the usual Hi-Vol Kraft envelope with the pertinent information on it to the Physical Methods Laboratory, Resources Road, Toronto.

VIII. COMPLAINT AND LEGAL SAMPLING

1) Request and Report Forms

Complaint and Legal samples should be accompanied by appropriate Analytical Request and Observation/ Inspection Report Forms as illustrated in Figures 4 and 5. These forms should provide all the information required to make a proper assessment of the situation. A sketch map of the area is strongly recommended. If insufficient space is available on the form, add further sheets as necessary.

Results will be reported on the Sample Analysis Report form (Figure 6).

2) Fallout

Personnel collecting complaint samples should be equipped with an Inspector's Sampling Kit available from the Regional Industrial Abatement or Technical Support Managers. Details for sampling are to be found in each kit. Dustfall should be either brushed or carefully transferred with a spatula or knife into a small petri dish. As large a sample as possible should be collected in order to enable multiple analysis. "Pick-up" by Scotch tape is acceptable when only microscopic analysis is required. However, in most cases it is not recommended. When insufficient material is available for sampling, local eavestroughing may contain a sufficient amount of the required material.

When leaves are sampled for dustfall coating, the whole leaf should be taken, placed in a perforated plastic bag and IMMEDIATELY transported to the laboratory.

3) Gas Damage

Gas damage complaints commonly involve of H_2S damage of lead based paints. A paint chip should be removed and placed in a petri dish. A paint "blank" (obtained from a place where damage is unlikely to have occurred) should also be included.

It is advisable to inspect silverware or other silver articles if available. These will invariably be tarnished. if H_2S is present in sufficient concentrations.

In special cases, static samplers similar in function to the sulphation candles, are available from the Physical Methods Laboratory.

4) Snow

Heavy dustfall onto snow should be sampled by scooping the snow into a large mouth-glass or plastic bottle in such a way as to maximize the amount of particulate material obtained and prevent any

Ontario

FIGURE 4

Ministry of the
Environment

LABORATORY SERVICES BRANCH

Air Quality Laboratory

Sample No.	
Air Quality	AQ
Abatement	A
Phytotoxicology	P
Automotive	Au
Approvals	Ap
File No.	

Request for Analysis

TO: Chief, Air Quality Laboratory

FROM:

DATE:

SUBJECT OR
LOCATION:

DATE:

SUBMITTED BY:

NO. & DESCRIPTION
OF SAMPLE:

CAUSE OF COMPLAINT
(Please attach
Inspector's Report)

SUSPECTED CONTAMINANTS:

ANALYTICAL PARAMETERS:

AIR QUALITY SURVEY:

a) IN PROGRESS ☐
b) TO BE INITIATED ☐

ABATEMENT:

a) COMPLAINT ☐
b) COURT CASE ☐

.....

Authorized Signature

Ministry of the Environment

Ontario

FIGURE 5

Violation No. .....

Complaint No. .....

OBSERVATION/INSPECTION REPORT

Date ..... 19.....

Address .....

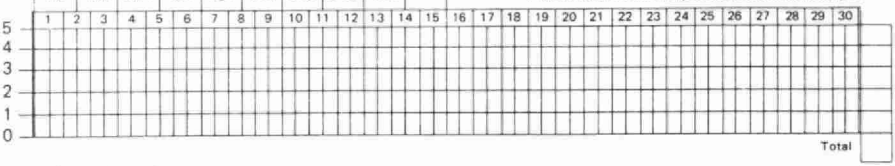
Premises known as .....

Owner's name .....

Owner's address .....

FB	Inc.	O.F.	Ind.	Agr.	Veh.	Ship	Dmp.	Oth.	

From ..... am/pm to ..... am/pm



Observation point .....

Wind direction/speed ..... Weather .....

Equipment .....

.....

.....

Remarks .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Inspector ..... Senior Inspector ..... District ..... Region .....

Ontario

FIGURE 6

Ministry of the Environment

DATE:

FILE NO:

c.c. Assistant to Manager
File

LABORATORY SERVICES BRANCH

AIR QUALITY LABORATORY

Sample Analysis Report

Issued to:

Sample No:

Location:

Region:

Date:

Submitted by:

Description of sample:

Results:

Analysed by:

Approved by: _____
Manager, Air Quality Laboratory

possible contamination from soil.

5) General Legal Considerations

The following points should be exactly adhered to when collecting court case samples: (cf Section VII, Legal Sampling of Water).

i) The lab must be notified before any court case samples are taken.

ii) It is very important that CONTINUITY OF POSSESSION IS GUARANTEED from the time of sampling to analysis. Until the sample is accepted by the laboratory, it must be under the CONSTANT and SOLE control of the sampler.

iii) Personal delivery of the sample to the laboratory by the sampler is recommended; if this is impossible, shipping in the locked water sample boxes (discussed in Section VII) is required.

iv) The normal precaution of sample container sealing is necessary.

v) Enquiries regarding legal sampling should be directed to Dr. J. A. Pimenta (Physical Methods Laboratory, Resources Road, 416-248-7101), or D. Sturgis (Project Scientist, 880 Bay Street, 416-965-1574).

APPENDIX I

Sampling enquiries should be directed to the appropriate individual(s) listed below:

WATER QUALITY SECTION

Process Water	B. Stundzia (Supervisor)	248-3022
(Sewage and Drinking Water)	Dr. A. Hinds (Control Scientist)	248-3022
Rivers and Lakes	Dr. F. P. Dieken (Supervisor)	248-3003
	Dr. D. S. Jeffries (Control Scientist)	248-3003

INORGANIC TRACE CONTAMINANT SECTION

Effluents	Dr. B. Loescher	248-3775
Sediments and Soils	Mr. F. Darcel	248-3775
Spectrography	Dr. M. Moselhy	248-3029
Organometallics	Dr. O. W. Berg	248-3031

ORGANIC TRACE CONTAMINANT SECTION

Pesticides	Mr. G. Rees (Supervisor)	248-3743
Spectroscopy	Mr. G. Wyhovszky (Supervisor)	248-3469
Chromatography	Dr. A. Nicholson (Supervisor)	248-3031
Mass Spectrometry	Mr. W. Duholke	248-3755

MICROBIOLOGY SECTION

Water Quality	Mr. A. Burger (Supervisor)	248-3008
Rivers and Lakes	Mr. J. Clark (Supervisor)	248-3008
Process Wastes	Dr. D. Rokosh (Scientist)	248-3008
Great Lakes	Mr. M. Young (Scientist)	248-3008

AIR QUALITY SECTION

Inorganic	Dr. A. B. Foster	965-1574
Organic	Dr. E. A. Adamek	965-1574
Vegetation and Soils	Mr. R. Wills	965-1574
Physical and Complaint Samples	Dr. J. A. Pimenta	248-7101

LONDON REGIONAL LABORATORY

Mr. D. Glutek (Chief)	681-3600
Dr. W. Cook	681-3600

THUNDER BAY REGIONAL LABORATORY

Mr. A. Perras (Chief)	622-5851
Mr. M. Mazurski	622-5851

KINGSTON REGIONAL LABORATORY

Mr. S. MacBeth (Chief)	549-4000
Dr. A. Ley	549-4000

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